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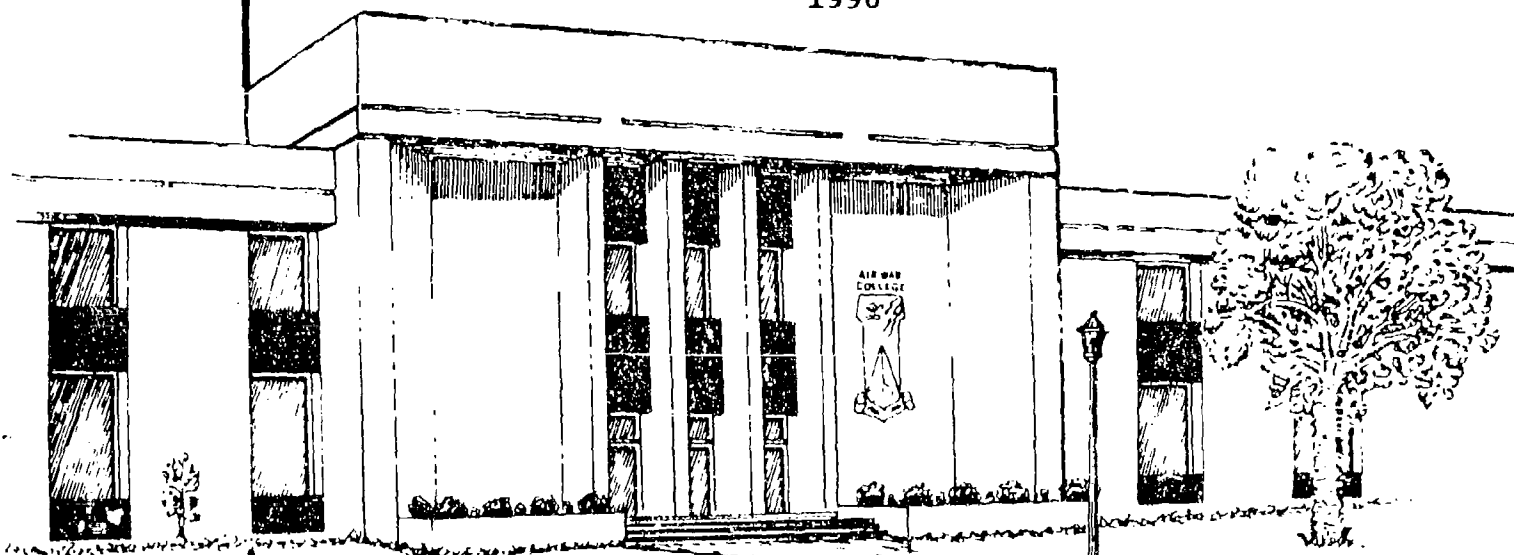
## RESEARCH REPORT

NIGHT TRAINING: A BETTER WAY

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AIR UNIVERSITY  
UNITED STATES AIR FORCE  
MAXWELL AIR FORCE BASE, ALABAMA

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NIGHT TRAINING: A BETTER WAY

by

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A DEFENSE ANALYTICAL STUDY SUBMITTED TO THE FACULTY

IN

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## TABLE OF CONTENTS

DISCLAIMER.....	ii
EXECUTIVE SUMMARY.....	iii
BIOGRAPHICAL SKETCH.....	iv
Chapter	
I. INTRODUCTION.....	1
II. LIMITATIONS/ASSUMPTIONS.....	3
III. HISTORY OF F-111 NIGHT TRAINING.....	4
IV. AN ANALYSIS OF TACH 51-50.....	5
TACH 51-50 Night MQT Training.....	6
Standard Sortie Requirements.....	9
Night TFR Training.....	10
Night Weapons Qualification Requirements.....	15
V. NIGHT RED FLAG.....	19
History of Red Flag.....	19
A Proposal For Night Red Flag.....	21
VI. ORGANIZATION FOR NIGHT.....	23
VII. SUMMARY OF PROPOSED NIGHT TRAINING.....	25
VIII. SPECIAL PROBLEMS IN USAFE.....	27
IX. CONCLUSIONS/RECOMMENDATIONS.....	29
X. CONCLUSION.....	31
Glossary.....	32
Notes.....	34

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## EXECUTIVE SUMMARY

TITLE: Night Training: A Better Way: Richard L. Brenner, Lieutenant Colonel, USAF.

With the advent of the F-15E, the LANTIRN F-16, and F-111 avionics overhauls, the TAF is equipping its aircraft with a robust capability to fight at night. Sadly, the TAF's flying training programs are not structured to do the same. In 1975, roughly half of all F-111 training was conducted at night. Today, although 40 percent of F-111 sorties are flown at night, F-111 night training requirements are a mere 10 percent of what was formerly required. New night training programs associated with the F-15E and LANTIRN F-16 appear to be little better.

The solution to the problem lies in revitalizing TACM 51-50 (Tactical Aircrew Training Fighter). This study provides an outline, with accompanying rationale, for improving the quality of night training in the TAF. It does this by analyzing the current F-111 night training program. Key tenets of the study propose incorporating the following into TACM 51-50: more actual night low level training including a night low altitude step down training program; night weapons qualification requirements; night live ordnance deliveries; and creation of a night Red Flag exercise totally dedicated to night combat preparation and training.

Night training cannot be simulated by flying in the day--no matter how hard we try to convince ourselves it can. Therefore, meaningful night training programs need to be implemented. This study provides a start in doing that.

#### BIOGRAPHICAL SKETCH

Lieutenant Colonel Richard L. Brenner is a command pilot with over 3800 hours of flying time and over 2500 in the F-111A, F-111E, and F-111D aircraft. He has a Bachelor of Science Degree from Southern Illinois University, and an M.B.A. from Troy State University, Alabama. He has been assigned to the F-111A at Nellis AFB, Nevada and Mountain Home AFB, Idaho; to the F-111E and Royal Air Force Upper Heyford, England; and to the F-111D and Cannon AFB, New Mexico. His duties in the F-111 have included duties as an instructor pilot, flight examiner, mission director, functional check flight pilot, and flight commander. He has had an assignment to Headquarter Tactical Air Command at Langley AFB, Virginia where he worked in the Weapons and Tactics Division. He served as the commander of the F-111 Division of the USAF Fighter Weapons School during his most recent assignment. He is a graduate of Air War College, class of 1990.

## NIGHT TRAINING: A BETTER WAY

### I

To ensure the readiness of our forces, commanders must develop and implement training programs that build required warfighting skills and that simulate, as much as possible, the combat environment in which we expect to fight. This means training in simulated combat conditions; and intense physical and electronic enemy threats. When we provide this kind of education and training, combined with superior aerospace equipment and capability to sustain our operations, we maintain the highest level of readiness. (1:4-7)

In today's Tactical Air Forces (TAF) vast improvements are being made toward increasing and improving the hardware to fight at night. The TAF has a stated goal of making the capability to fight at night with improved equipment and munitions for airfield attack, interdiction, close air support, air defense, and defense suppression one of its highest priorities. (2:42) With the procurement of 200 F-15E aircraft (3-10), acquisition of the F-111G from Strategic Air Command, and improvements to older F-111s through the Avionics Modernization Program (AMP) tactical aircraft are becoming more survivable and capable under a broader range of conditions. Add to this the fact that funding for the Low-Altitude Navigation and Targeting Infrared System for Night (LANTIRN) in FY 1988 was \$820 million, planned for FY 1989 was \$727.3 million, and proposed for FY 1990 was \$355.3 million; and it becomes apparent that the TAF is developing a robust capability to fight any time day or night. (4:16)

It is obvious that the US Air Force is serious about nighttime employment of tactical air. Current night flying

training programs, however, are inadequate in preparing crews to fight and survive at night. The quality and quantity of night flying training in the TAF has not kept pace with improvements in day training programs. In Vietnam, crews went into combat ill prepared to fight at night. Not until late in the war were night tactics and procedures "updated." (5:21) It is unlikely the next war will present opportunities for night combat laboratories. Now is the time to reach new plateaus in night training. To do this, Tactical Air Command Manual (TACM) 51-50, Tactical Aircrew Training, needs enhancement to fully prepare for anticipated night wartime tasking.

This paper will use TACM 51-50 to analyze and examine ways of improving F-111 night training programs. Although the study will focus primarily on F-111 training, the analysis has applicability for night training programs in F-15E and F-16 LANTIRN aircraft. The first part of the paper will cover the limitations and assumptions used in the analysis. This will be followed by reviewing the historical development of night training in the F-111. The next element of the study covers current TACM 51-50 night training requirements and recommends areas for improvement. Following this, the feasibility of developing a night Red Flag is discussed. Since no study of F-111 night training would be complete without covering the unique training problems confronting F-111 units based in Europe, the problems faced by USAFE units are examined. The final portion of the paper provides conclusions and



recommendations for improving night training throughout the TAF.

## II

It needs to be made clear from the beginning that this is not an attempt to rewrite or restructure TACM 51-50. In fact, since its inception in 1977, the training road map provided in TACM 51-50 has continually improved. One F-111 wing commented on the sufficiency of TACM 51-50 by saying: "To start with I think the current MCM 51-50 layout, intent, and values are excellent....There are many who say we need to get rid of it and start over. To take this path would be tossing the baby out with the water." (6:1) The USAF Director of Operations, DCS/ Plans and Operations, Major General Webb III stated: "While these improvements (in equipment and maintenance) have given us the proper tools, the focus must now shift to the warrior--the ultimate determinant of success in combat. Realistic training--the way we plan to fight--is the third dimension of combat." (7:105) These are strong testimonies that accurately reflect how much the TAF's flying training has improved in recent years.

TACM 51-50 is currently under revision. Publication of the new single volume concept of the training manual is imminent. As a result, this study combines the information contained in the "old" TACM 51-50, Volume I (Tactical Aircrew Training), dated 30 October 1985; and the "new" TACR 51-50, Volume XII (F-111 Tactical Aircrew Training), which is in draft

format. By using these editions as primary sources of information, it is hoped only the most current night training directives will be explored for deficiencies. For ease of reading it should be noted that when TACM 51-50 (emphasis on "manual") is used the "old" volume is being cited as the source. When TACR 51-50 (emphasis on "regulation") the "new" volume is being used as a reference.

Also, it is not within the scope of this study to address sorties, events, and weapons qualifications required for formal course syllabi and formal upgrade training. Rather, the analysis will concentrate only on the night continuation training aspects of TACM 51-50.

### III

Looking back to the type of night training conducted in the mid 1970s will provide a foundation for comparing the quantity and quality of training currently conducted in the F-111 community. Table 1 shows the night training that was required in 1975. During this period Red Flag was in its infancy, live ordnance drops were almost nonexistent, and formal defensive air combat training was excluded from training manuals. However, the overall night training program was solid. Table 1 reveals, when compared with Table 3, just how much night training has eroded over the last 15 years. As an example, in 1975 TACM 51-111 required 20 night weapons, and weapons related, events; now, TACM 51-50 requires a maximum of two specifically directed night weapons events.

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TABLE 1: 1975 F-111 MR NIGHT TRAINING REQUIREMENTS (8:6-11 to 6-15) (Inexperienced/Experienced) NUCLEAR CONVENTIONAL

NIGHT SORTIES (TOTAL)	21/14	N/A
NIGHT RLD (TOTAL)	12/9	16/6
-NIGHT DIRECT TARGET AIMING	2/2	2/0
-NIGHT OFFSET TARGET AIMING	2/2	2/0
-NIGHT FIRST LOOK TARGET AIMING	2/2	2/0
-NIGHT TFR DELIVERY	5/2	5/3
-NIGHT EMERGENCY DELIVERY	1/1	2/0
-NIGHT BEACON BOMB	0/0	3/3
NIGHT RLADD	2/2	0/0
NIGHT RBS (Now called STR)	3/2	3/1
NIGHT PROFILE PRACTICE BOMB	1/1	0/0
NIGHT RWR/ECM	4/2	4/2
NIGHT CHAFF/FLARE DEPLOYMENT	3/2	3/1
NIGHT LOFT OR TOSS	0/0	1/1

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#### IV

TACM 51-50: "Establishes continuation training standards and programs to ensure that units maintain the capability to perform their assigned tactical mission in an effective manner." (9:1-1) In light of the fact that realistic training must be balanced against the threat, aircrew capabilities, available assets, and safety; this section will cover current F-111 night training requirements while providing an assessment

of how overall night training, and consequently combat capability, can be improved.

After a crewmember completes Initial Qualification Training (IQT) he is assigned to a squadron where he completes Mission Qualification Training (MQT). Mission Ready (MR) status is achieved upon completion of MQT training. Table 2 briefly describes current MQT sortie requirements:

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TABLE 2: F-111 MQT TRAINING (10:3-3)

SORTIE NAME	LOW LEVEL	RANGE	NIGHT
MQT-1*	YES	YES	NO
MQT-2	YES	YES	NO
MQT-3	YES	YES	NO
MQT-4	YES	YES	NO
MQT-5	YES	YES	NO
MQT-6*	YES	YES	NO

---

\*Minimum sorties required for upgrade to MR.

Several problems become obvious when this table is reviewed. First, TACR 51-50 requires no MQT night training prior to achieving MR status. In 1975, one instructor supervised night TFR mission was required prior to achieving MR status. Chapter 7 of TACR 51-50 states that MQT training will include one sortie of each type for which the unit is tasked, but as shown in Table 2 a night sortie is neither described or required. The regulation goes on to say that night tactical

events are not a prerequisite for MR status unless specified by the major command. TAC, for example, has levied no such requirements for F-111s.

Since MQT training is conducted with a squadron supervisor, and since there is no formal night MQT training requirement, a crewmember can attain MR status and fly at night without ever being supervised at the squadron level. In other words, a crew is required to be supervised at night sometime during the IQT or MQT phase of training, but supervision of any specific night task, like TFR or weapons delivery, is not required. The only requirement for flying "night training events" is having demonstrated proficiency in a similar event during the day. This may be acceptable, but is probably not the best way to ensure crews are fully qualified in one of their most demanding missions.

The solution to this problem is simple. There should be a requirement for night supervised MQT training before becoming MR. TACR 51-50 needs to include a night MQT sortie description in its MQT training program. This sortie, or sorties, should require both night TFR and night weapons deliveries. Finally, to allow some amount of flexibility, night sortie requirements should be allowed to be delayed until the next unit night flying period as now recommended in the regulation. If delayed, however, the crewmember should only be declared "Day MR" until his night requirements are completed. The fact that there is currently no differentiation between day and night MR

aircrews points to a training documentation problem.

TACM 51-50 requires that wings submit a semiannual report on total number of crews qualified for day low level operations at 100 feet AGL, 300 feet AGL, and 500 feet AGL; and on the number of crews cleared to fly offensive LOWAT. (11:6-5)

Curiously, there is no requirement to report any night qualification. One F-111 Deputy Commander for Operations explained it this way: "The bottom line is that by the time the first half of the calendar year draws to a conclusion, there is no unit (in USAFE) that still maintains a bonifide night currency. Yet, this factor is not readily apparent in any report of GCC accomplishment." (12:1) As a minimum, crews declared "Day MR" should be formally tracked and reported as should other crucial night training requirements. The advantages of tracking night training requirements are twofold: first, it would show command interest through formal reporting; and second, it would provide the impetus needed for the wing to complete outstanding night requirements. The importance of tracking night training requirements like night TFR altitudes and night weapons qualifications are discussed later in this study.

Current TAC TACR 51-50 night sortie and night training event requirements are analyzed next. USAFE night training requirements are covered in Chapter VIII. Table 3 shows the F-111 GCC sortie program and required night training events. (13:1-6)

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TABLE 3: TAC F-111 STANDARD SORTIE REQUIREMENTS/NIGHT EVENTS

(Inexperienced/Experienced)	LEVEL A	LEVEL B	LEVEL C
GCC SORTIE TOTALS	31/27	38/34	49/45
-BASIC CONVENTIONAL/INSTRUMENT CORE	16/14	19/18	21/20
-PRIMARY UNIT TASKS	12/10	15/13	16/14
-ADDITIONAL UNIT TASKS	N/A	3/2	10/9
-ACBT	3	1	2
-NIGHT See Note 1	(10/8)	See Note 2	
NIGHT EVENTS			
-TFR (Night or IMC)	6	6	6
-TOSS	N/A	N/A	4
-WEAPONS EVENTS	2	See Note 2	

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Note 1: The information for this table was derived from Headquarters Tactical Air Command GCC Tasking Message current in December 1989. (14)

Note 2: Number of night sorties and weapons events at GCC Levels B and C are determined by the unit commander.

As a goal, TACR 51-50 recommends that at least half of the overall sorties should be flown at night. Nonetheless, GCC tasking only requires that 32 percent (inexperienced) and 30 percent (experienced) be flown at night at GCC Level A. When collateral sorties are added in, the percentage of night sorties can "legally" decrease further. As can be seen from Table 3, increased training at GCC Levels B and C does not

automatically require an increase in night sorties.

Nonetheless, according to a recent TAC/XPPC study, TAC F-111s are doing quite well in that they are actually flying about 40 percent of their sorties at night. The quality of night training, however, is not discussed in the TAC study. It is interesting to note here that the same study shows non-LANTIRN F-16s and F-4Es flying five percent of their sorties at night, LANTIRN F-16s projected to fly 23 percent of their sorties at night, F-15Es flying 31 percent of their sorties at night, and all F-117 sorties flown at night. Up to 50 percent of LANTIRN requirements can be accomplished using the Vision Restricting Device. The question remains then whether or not F-15E crews are fully prepared to fight at night in only 15 percent of their sorties are actually flown during the hours of darkness.

It is also readily apparent from Table 3 that emphasis is placed more on sortie accomplishment than on accomplishment of specific night training events. A brief look at Tables 1 and 3 exposes a dramatic decrease in night event requirements from past to present.

Under current guidance a crewmember must complete six TFR events per training cycle. A TFR event is defined in TACM 51-50, Volume I, as a low level route using the TFR systems the length of which must be at least 100 NM. (15:4-1) This event can be accomplished either during the hours of darkness or in IMC (day or night). Although route length is defined for night TFR, length in time or distance in actual IMC conditions is not



currently defined in the training manual. What this means is that a crew could, theoretically, complete his night TFR requirements without ever flying night TFR. This is because the current "night" TFR requirement can be fulfilled by flying an unspecified amount of time in day IMC. This is unacceptable considering the TAF trains the way it plans to fight.

At GCC Level A, a WSO must accomplish two radar "hits" per training period. A hit is a score within the scoring criteria for that event. A pilot is only required to accomplish two "deliveries" at night to complete his requirements.

Night toss deliveries are not required until attaining GCC Level C; and then, according to the current TAC GCC Tasking Message, only eight crews in each MR squadron are required to achieve this goal. Add to this the fact that the night toss requirement was recently (since the first training cycle of CY 89) moved from a GCC Level B requirement, and it seems that more emphasis and realism are required in the night training program. (16:45)

Night operations are always difficult, more dangerous than day, and require trained and experienced crews. There is no substitute for quality night training--it cannot be substituted (not even with VRDs [Vision Restricting Device]). So what needs to be added to the current night training program to make it more meaningful? The next part of this study will explore some plausible, realistic options for improving the overall night capability of the F-111 community.

As covered earlier, TAC Combat Coded F-111 squadrons are not tasked to fly about one-third of their sorties at night. A 30/70 percent mix of night and day sorties is probably sufficient to adequately train crews for the night mission. Within this framework of day and night sorties, however, a sounder training plan can and should be developed to improve night combat capability through training.

To begin with, TFR events should be made a requirement for completing night GCC sorties. As previously noted, this is not necessarily a hard and fast requirement under current guidance. In addition to this, the number of TFR events should be tied directly to the number of night GCC sorties required, e.g., a requirement of 10 night sorties should automatically require the flying of 10 night TFR low levels. Doing this would improve night training by placing more emphasis on one of the F-111's unique capabilities--night low level penetration.

Over the last 18 months, TACM 51-50 has been expanded and improved through adoption of a formal day Low Altitude Step Down Training (LASDT) program. The purpose of the program is to improve safety during low altitude operations during all aspects of low level tactical employment. This program encompasses training sorties, certification, and currency requirements. The program uses the building block approach (easiest to hardest) in a three phase training process that eventually qualifies crews to fly at 100 feet AGL. (17:36) The three low level phases are: Category I-1000 feet AGL to 500

feet AGL, Category II-500 feet AGL to 300 feet AGL, and Category III-300 feet AGL to 100 feet AGL. The program describes a comprehensive academic program, provides detailed mission descriptions, explains supervision requirements, and outlines currency and recurrency requirements. (18:6-13 to 6-17)

"Flying realistic missions safely during daylight hours is a difficult task, flying realistic missions safely at night is exponentially more difficult." (19:3) If this thesis can be accepted, then why has a night low altitude step down training program not been developed for the TAF and incorporated into TACM 51-50? If flying lower in the day is more difficult, increases risk, then the same must hold true for night low level training. Several things can be done within the current night sortie allocations to not only make night training better, but also safer.

There is an obvious requirement for a night low level step down training program. It should be based on the building block approach and structure similar to that now used for the day LASDT program. The following outlines what an optimum night stepdown training program should look like:

**ACADEMICS:** Review of TFR procedures and techniques, crew coordination, mission planning, emergency procedures, weapons deliveries and recoveries, night deconfliction, and airspace restrictions.

**SIMULATOR:** Used, if available, to practice TFR

procedures, crew coordination, switchology, threat reactions, weapons deliveries and recoveries, and emergency procedures.

**FLYING:**

-Category I: TFR conducted at 1000 feet AGL. Range events include level deliveries on a controlled or Strategic Training Range (STR).

-Category II: TFR conducted at 750 to 400 feet AGL. Range events include level deliveries on a controlled range or STR.

-Category III: TFR conducted at 300 to 200 feet AGL. Range events include toss deliveries and recoveries back to TFR altitudes. Live ordnance deliveries authorized at this level of training.

**SUPERVISOR REQUIREMENTS:** A minimum of one supervised flight required at 1000 feet AGL and 400 feet AGL. MQT supervised training meets the requirement for night TFR at 1000 feet AGL.

**CURRENCY:** Crews will not be expected to remain current at the Category II or Category III levels of night training. In fact, the purpose of this approach to training is to systematically build up proficiency to fly and tactically employ at 200 feet AGL at night. As a result, the night step down training program will be based on attaining a "night" currency rather than becoming current flying day events or a combination of day and night events to achieve night currency as is presently done. Recommended currencies are:

Category I: Must have flown a day TFR within the previous 15/30 (inexperienced/experienced) days. This is the same as currently written in TACM 51-50.

Category II: Must have flown a night TFR within the past 15 days. This ensures night TFR proficiency at 1000 feet AGL prior to flying at 400 feet AGL in Category II. Night live weapons deliveries authorized at this level.

Category III: Must have flown a Category II night TFR event within the previous eight days. This ensures a maximum level of night proficiency prior to accomplishing TFR at 300 and 200 feet AGL, night tosses, and night live weapons deliveries.

RECURRENCE: Remains the same as now written in TACM 51-50.

The above recommended training program provides a logical flow of training from the easiest to the most difficult. The night stepdown training program described enhances safety by precluding a crew from flying at the lower TFR altitudes without first having flown dedicated sorties at the higher, less demanding, altitudes. The bottom line is that it only makes sense that if a day LASDT program is required, then there should be a night LASDT program. Having covered night TFR training, night weapons deliveries are explored next.

When reviewing weapons qualification requirements contained in TACM 51-50 it becomes obvious that night weapons events receive much less emphasis than day weapons events. For

example, TACM 51-50 requires four day nuclear and 10 conventional hits per training cycle. (20:6-48) (USAFE F-111F units have additional GBU-15 [Guided Bomb Unit] and LGB [Laser Guided Bomb] requirements. The specialized nature of these requirements preclude their discussion here). In accomplishing these hits, at least 50 percent have to be within the hit criteria established in the regulation in order to maintain qualification in a event. Basic requirements defined in TACM 51-50 do not require any night events or night weapons qualification. (TAC GCC Tasking Message does require a WSO [Weapons System Officer] to get two RLD [Radar Laydown] hits at GCC Level A, and requires four toss events, not hits, at GCC Level C). Not only are crews not required to qualify in night weapons deliveries, they are not required to maintain a 50 percent hit rate at night.

By increasing emphasis on night weapons deliveries quality of night training is improved. Several factors work to make this happen. A crew who is required to qualify at night, or at least maintain a 50 percent hit rate, will spend more time on radar target study. Crew coordination will be improved by spending more time briefing switch positions, backup deliveries, parameters, weapons safe escape, and error analysis. Bombs falling outside the established hit criteria will drive the crew into spending more post-flight time reviewing radar film and video tape recorder (VTR) tapes. The raid on Libya, although highly successful, clearly showed just

how critical each of these elements of night training are.

If GCC tasking requires about 30 percent of the sorties to be flown at night, then it follows that a like proportion of weapons events should be flown at night. WSOs should require night qualification in level radar deliveries at GCC Level A. Based on a GCC Level A night sortie rate of 10/8 (See Table 3) 10 level radar hits per training cycle should be required. This would translate into a crew being required to get an average of one hit per night sortie which is definitely within the realm of realistic night training requirements. Pilots should be required to accomplish 10 night level deliveries at GCC Level A. For the same reasons covered above, at GCC Level C a WSO should be required to get four hits per half rather than merely accomplishing four deliveries. Since toss is truly a crew event, pilots should also have the requirement of four hits per half. A sound night weapons training program make these achievable and desirable goals.

Two other night weapons events require addressing. The first is that the current TACM 51-50 does not require training on an STR site (formerly called RBS [Radar Bomb Site]). The advantages of using STR sites is that it provides the opportunity to get away from the home range where rote radar aiming points are used on almost every sortie. In addition to providing varied "first look" radar scope interpretation, STR sites provide the much needed opportunity for target intelligence personnel to draw up "real world" radar

predictions thus providing invaluable training to prepare for combat contingencies. The availability and number of these ranges has steadily been diminishing to the point that there are now fewer than five STR ranges west of the Mississippi. (21) However, there are still enough available to provide quality night radar training.

The final, and arguably the most contentious, night weapons issue is that there is no requirement to accomplish night live munitions drops. Fifteen years ago live drops within the TAF were virtually nonexistent with the exception of a few live fire demonstrations. (22:10) Today, great strides have been made in exposing crews to virtually every weapon they can be expected to drop in combat. This is done through day live ordnance training programs. TACR 51-50 states that: "Live ordnance training is essential to aircrew combat capability. Aircrews should be regularly scheduled to participate in live ordnance training." (23:6-12) However, there are no stated requirements to practice delivering live ordnance at night. The F-111 Division of the USAF Fighter Weapons School is the only F-111 unit employing live weapons at night on a regularly scheduled basis. If training realism is the goal, then night live munitions drops are a requirement for operational F-111 units.

Probably the biggest deterrent to accomplishing night live ordnance drops is the availability of night live weapons ranges. F-111s flying out of Mountain Home AFB, Idaho can use



the Nellis AFB, Nevada live ordnance ranges because the ranges are only 300 NM away. This relatively close proximity permits launches and recoveries from the home station without requiring air refueling. The other CONUS F-111 base, Cannon AFB, New Mexico, finds itself 700 NM from the Nellis live ordnance ranges. This precludes unrefueled night live drops on the Nellis ranges from Cannon AFB. The only other live ordnance range within unrefueled reach of Cannon AFB is Fort Sill, Oklahoma. This range is extremely small and not conducive to the tactical employment or realism afforded by use of the Nellis ranges. In USAFE the problem of range availability is more acute. Garvey Island is the only available live ordnance range in the United Kingdom and national rules prevent night live ordnance drops. No live ordnance ranges are available in the Federal Republic of Germany.

Does this mean the problems associated with night live ordnance drops fall into the "too hard to do" category? The answer is no. The solution lies in creating a night Red Flag where live weapons drops at night would not only be desired, but made an vital part of the exercise for all participating units.

## V

Since the first Red Flag in November, 1975, thousands of crews have been provided with the most realistic combat training in the world. The importance of this type of training is recognized at the highest levels. The Secretary of Defense

recently said: "Added realism through training in the way we expect to fight is the goal of our exercises. There are numerous examples of this approach, including the joint-service Red Flag exercises conducted at Nellis AFB, Nevada,..."

(24:159) From the first Red Flag to the present, Red Flag has created an atmosphere "designed to provide operational aircrews with realistic combat training in a high-threat environment."

(25:1) TACM 51-50 has a stated goal of scheduling every aircrew to participate in Red Flag every 15 months. This manual reiterates that the goal of Red Flag is to prepare aircrews for their wartime tasks. It also states that units should develop training programs to prepare aircrews for the unique challenges offered by Red Flag participation. (26:6-20)

From Red Flag 1 to Red Flag 89-2, there were 62 exercises. Of these, night was flown in only six of the exercises: Red Flag 78-2, Red Flag 78-8, Red Flag 79-2, Red Flag 80-1, Red Flag 81-1, and Red Flag 82-2. This means less than 10 percent of the TAF's premier combat oriented training was conducted with any emphasis at all on night employment. Further, these six exercises were not truly "night" Red Flags in that only a relatively small number of sorties were actually flown at night. For example, during Red Flag 78-2 (27:viii), Red Flag 78-8 (28:1-9), and Red Flag 79-2 ((29:1-10) an insignificant number of night sorties were actually flown. Insignificant in this case means night operations were mentioned in the report, but too few sorties were flown to track them separately.

During Red Flag 80-1, 30 percent of the sorties were flown at night (420 out of 1401 total); (30:1-2) during Red Flag 81-1, 16 percent of the sorties were flown at night (373 out of 2384 total); (31:2-3) and during Red Flag 82-2, 13 percent of the sorties were flown at night (282 out of 2188 total). (32:2-1)

The above information reveals two trends. First it appears that although the TAF is serious about providing aircrews with the most realistic training possible, it is only serious about doing it in a day VFR environment. And second, the decade of the 1980's is almost completely void of night Red Flag training. This in spite of the fact that our procurement of new equipment has greatly expand our potential to fight at night.

In reviewing the history of Red Flag, it may be understandable why the emphasis has been on day combat training; especially in light of the fact that a large portion of the TAF's night fighting capability was found in one aircraft, namely, the F-111. However, with the advent of the LANTIRN equipped F-15E, and F-16C/D, the F-117A, and the B-1B, now is the time to implement recurring night Red Flag exercises.

The most critical element in executing an all night Red Flag is the requirement to use the building block approach. Air-to-air units will require a plan to move from the simple to the more demanding night tasks. For example, air-to-air units should start their training employing two-ship formations in a

non ECM environment. From this they would work up to night four-ship employment in an ECM environment. The training would culminate with composite force employment and integration during a night Red Flag. (33:8) Air-to-surface units would start with single-ship employment at the night low level Category I, move then to night low level Category II, and complete the exercise flying at night low level Category III. (See pages 12 to 15 for a discussion of night low level categories).

The following list provides a brief description of the sorties recommended for air-to-surface units participating in night Red Flags:

RED FLAG 1: Low level flown at night low level Category I. Object: night local area orientation, low level proficiency, timing, and range orientation.

RED FLAG 2: Low level flown at night low level Category II. Objectives: two-ship night deconfliction, threat reactions, timing, and inert weapons employment.

RED FLAG 3 to X: Low level flown at night low level Category III. Objectives: composite force integration and deconfliction; timing, threat reactions, and live ordnance deliveries.

There are several obvious advantages to conducting night Red Flag exercises. If 30 to 50 percent of F-111 continuation training is conducted at night, then operational realism must be gained through participation in Red Flags which are totally

dedicated to night composite force employment. "The low level night mission is one of the most demanding a pilot can be given, and aircrews must be thoroughly acclimated and experienced in the night combat environment." (34:1) Night Red Flags will provide the much needed opportunity for night live ordnance deliveries, and in fact, it is the only potential opportunity for USAFE units to accomplish night live weapons deliveries. Finally, night Red Flags will provide invaluable experience in developing the night composite force tactics, techniques, and confidence necessary for survival during night operations.

## VI

In order for this new approach to night training to work, some organizational and scheduling changes are required. It was emphasized earlier in this study that the number of night sorties flown by F-111 units is sufficient to implement the night training program outlined in this paper, but changes are required in when and how the sorties are flown. Three options exist: schedule enough night sorties to complete TACM 51-50 night requirements (this is the plan currently used by most units); develop night squadrons totally dedicated to night flying; or combine day and night sorties to achieve specific night training goals.

Under the current approach to night training, units generally schedule night sorties only as needed to fulfill night training requirements. (USAFE units tend to fly every

third week at night, but due to the northern latitude, "night week" is actually flown in day conditions during the summer months). The current approach then is to schedule to "fill night squares" rather than meet night training goals. Except for the total number of night sorties required, other night training requirements are vaguely defined by TACM 51-50. Ironically, this way of scheduling for night actually works fairly well because current night requirements are rather easy to complete. However, this approach is unsuitable when considering the path to meaningful night training proposed in this study.

On the other extreme, a case has been made for developing night fighter squadrons totally dedicated to flying at night. In a study completed for the Air Command and Staff College, Major Fleming developed the thesis that in order to build a true night capability, there should be dedicated night fighter squadrons. He proposes that aircrews be assigned to these squadrons for a period of 18 months and then allowed to move to a day squadron. (35:12 to 16) Although this approach would ensure highly qualified night aircrews, its solution to the problem of night training is probably too extreme.

The most workable solution seems to be one in which the current night program is modified. Scheduling a week of nights is fine for "square filling," but does not build the necessary night continuity and proficiency required to implement realistic night training as outlined in this study. To move

from flying at night at 1000 feet AGL to 200 feet AGL, from inert weapons deliveries to night live weapons deliveries, and from single-ship missions to composite force integration at night Red Flags; units will need to schedule prolonged (longer than one week) periods of night flying. Charles Czeisler, a neuroscientist at the Harvard Medical School, suggests that the ideal day to night work cycle is 18 days. (36:14) Therefore, squadrons should be scheduled to fly at night for a minimum of three weeks in a row. This will provide the necessary continuity using the building block approach to be able to execute the most demanding night missions without increasing the total number of night missions flown.

## VII

The following table provides a summary of the night training requirements proposed in this study. It compares the current TACM 51-50 night training requirements with those supported in this work.

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TABLE 4: PROPOSED F-111 SORTIE REQUIREMENTS/NIGHT EVENTS

(Inexperienced/experienced)	LEVEL A	LEVEL B	LEVEL C
OLD BASIC CONVENTIONAL/INSTRUMENT CORE	16/14	19/18	21/20
NEW BASIC CONVENTIONAL/INSTRUMENT CORE	16/14	19/18	21/20
OLD PRIMARY UNIT TASKS	12/10	15/13	16/14
NEW PRIMARY UNIT TASKS	12/10	15/13	16/14
OLD ADDITIONAL TASKS	N/A	3/2	10/9
NEW ADDITIONAL TASKS	N/A	3/2	10/9

OLD ACBT	3	1	2
NEW ACBT	3	1	2
OLD NIGHT (Not included in total)	(10/8)	See Note 1	
NEW NIGHT (Not included in total)	(10/8)		
OLD GCC TOTALS	31/27	38/34	49/45
NEW GCC TOTALS	31/27	38/34	49/45
NIGHT EVENTS			
-OLD TFR (Night or IMC)	6	6	6
-NEW TFR (Night)	10/8	See Note 2	
-NIGHT CATEGORY I	YES	N/A	N/A
-NIGHT CATEGORY II	N/A	YES	N/A
-NIGHT CATEGORY III	N/A	N/A	YES
-OLD TOSS (Deliveries)	N/A	N/A	4
-NEW TOSS (Hits)	N/A	N/A	4
-OLD WEAPONS EVENTS	2	See Note 3	
-NEW WEAPONS EVENTS			
--LEVEL (RLD)	10	10	10
--STR	3	3	3
--LIVE	N/A	See Note 4	
MT RED FLAG	See Note 5		

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Note 1: The information for the "old" information in this table was derived from Headquarters Tactical Air Command GCC Tasking message current in December 1989. (37)

Note 2: Night TFR events changed to duplicate the number of night GCC sorties required. Day IMC TFR no longer fulfills the



night TFR requirement.

Note 3: Under the current system, only two hits are required at night. The proposed program requires 10 hits at night in addition to night weapons qualification and maintenance of a 50 percent hit rate.

Note 4: Night live ordnance sorties can be flown at GCC Level B at night low level Category II.

Note 5: Night Red Flag participation is encouraged.

#### VIII

Table 5 provides an overview of USAFE night continuation training requirements for January through June 1990. (38:1)

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TABLE 5: USAFE F-111 STANDARD SORTIE REQUIREMENTS/NIGHT EVENTS

(Inexperienced/Experienced)	LEVEL A	LEVEL B	LEVEL C
GCC SORTIE TOTALS	30/24	42/36	54/48
-NIGHT SORTIES	4	7	10
-SAT NIGHT PROFILE	3	6	9
NIGHT EVENTS			
-NIGHT TFR	3	6	9
-NIGHT WEAPONS HITS (See Note 1)	NONE	4/YR	10/YR
-NIGHT RBS/VTR HITS (See Note 2)	8/YR	10/YR	10/YR

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Note 1: Per year means that item is an annual requirement and not a semiannual requirement.

Note 2: Night weapons hits can count for RBS/VTR hits but not vice versa.

The above table shows that USAFE F-111 units are unable to train like their TAC counterparts. This is due to international flying rules, low level restrictions, climatology, and Allied Command Europe (ACE) Forces Standards. (39:1) For example, a quick comparison shows that USAFE units are required at GCC Level A to fly 23 and 29 percent (Inexperienced/Experienced) of their sorties at night compared to 30 and 32 percent respectively in TAC; and night weapons events are based on annual requirements as opposed to semiannual requirements in TAC. Nonetheless, much can be done to improve their night training through implementation of the night training program covered in this study. Special considerations for USAFE are:

- Move the training cycle for all night training requirements (sorties, events, and weapons) to the calendar year. (40:1) This would mean the first half of the year would be, for the most part, devoted exclusively to accomplishing night events during the October to March period, while reducing significantly the number of day events required in this training cycle.

- In-theater night low level categories can be no lower than Category II. This is due to current airspace restrictions. Night Category III training would be accomplished on deployments to Newfoundland, Turkey, Red Flag, etc. (41:21)

- Night Red Flag should be scheduled during the first half of the fiscal year to coincide with the USAFE emphasis on night

training during this training cycle.

-TACM 51-50 night weapons qualification requirements should be customized to recognize the vast differences in capability between the F-111F and F-111E.

## IX

This portion of the night training analysis will summarize its conclusion and recommendations. The overall purpose of this study was to examine F-111 TACM 51-50 night training requirements. The work provided and introduction, an historical review, and analysis of TACM 51-50, a review of Red Flag history, and some unique USAFE environmental problems.

### CONCLUSIONS:

-Although the TAF is vastly improving its ability to fight at night as evidenced by AMP upgrades to the F-111, acquisition of the F-15E, and development of the LANTIRN equipped F-16C/D; TACM 51-50 night training programs have remained stagnant.

-Night training in the F-111 has improved little, if any, in the last 15 years.

-TACM 51-50 does not require night training during MQT upgrade to MR.

-There is currently no requirement to track night qualifications or night capability.

-Current GCC-tasked night sortie requirements are sufficient to accomplish quality night training if the training is properly structured.

-Night TFR events can be accomplished at night or during day

IMC operations. The number of night TFR events do not equal the number of night GCC sorties required. (Vision Restricting Devices can be use to accomplish up to 50 percent of LANTIRN night training requirements in F-15E and LANTIRN equipped F-16 aircraft).

- Night weapons qualification is not required at any GCC level. There is no requirement in TAC to practice STR procedures during the training cycle.

- TACM 51-50 contains a detailed program for day low altitude step down training (LASDT). No similar program exists for night low level training.

- There is currently no requirement to practice night live ordnance deliveries.

- Red Flag exercises place very little emphasis on night combat training. The amount of night Red Flag training currently conducted is minimal. (It is appropriate to note here that there are tentative plans to conduct a total night Red Flag sometime during FY 91).

- USAFE units are encumbered with unique night training problems.

#### RECOMMENDATIONS:

- A night TFR sortie should be required during MQT upgrade.

- A formal system of tracking night qualifications should be adopted and included in TACM 51-50.

- To adequately train at night, the number of night TFR events needs to be increased. This study places the minimum number of

TFR events at 10 per training half. This number is coincident with the number of required at GCC Level A and should increase proportionally with the number of night sorties required at higher GCC levels.

-To increase the emphasis required for accurate night bombing both night weapons qualification and maintenance of a 50 percent hit rate are required.

-There is a requirement for the TAF to develop a night low altitude step down training program. A recommended approach to this training is contained in this work.

-TACM 51-50 should place more emphasis on accomplishing night live ordnance deliveries.

-A night Red Flag needs to be developed and implemented on a recurring basis--not an adjunct to day Red Flags.

-In USAFE, the night training cycle should be changed to coincide with the fiscal year.

X

It may sound at this final juncture that a case has been made for finding loopholes in the training approach taken by the current and proposed TACM 51-50. This is not the case. The fact of the matter is that if the TAF wants to maximize its night fighting capability, TACM 51-50 needs to clearly define concrete requirements that will build to this capability. In so doing, the ability to fight, win, and survive at night will become much more of a reality than it is today.

## GLOSSARY

ACBT	Air Combat Training
ACE	Allied Command Europe
AFB	Air Force Base
AGL	Above Ground Level
AMP	Avionics Modernization Program
CY	Calendar Year
ECM	Electronic Countermeasures
FY	Fiscal Year
GBU	Guided Bomb Unit
GCC	Graduated Combat Capability
IQT	Initial Qualification Training
IMC	Instrument Meteorological Conditions
LANTIRN	Low-Altitude Navigation and Targeting Infrared System for Night
LASDT	Low Altitude Step Down Training
LGB	Laser Guided Bomb
LOWAT	Low Altitude Air-to-Air Training
MCM	Multi-Command Manual
MQT	Mission Qualification Training
MR	Mission Ready
RLD	Radar Laydown Delivery
STR	Strategic Training Range
TAC	Tactical Air Command
TACM	Tactical Air Command Manual

TACR	Tactical Air Command Regulation
TAF	Tactical Air Forces
TFR	Terrain Following Radar
USAFE	United States Air Forces Europe
VFR	Visual Flight Rules
VRD	Vision Restriction Device
WSO	Weapons System Officer

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